

## 6. The Trigger and Data Acquisition System

### Trigger System

The goal of the trigger system is to select all neutrino interactions with minimum bias and high efficiency while maintaining a small overall trigger rate to minimize readout dead-time. To maintain a live-time of  $> 85\%$  required a trigger rate of 6 Hz or less during a spill. This condition is dictated by the scintillating fiber system CCD read-out time of 24 ms. The expected neutrino interaction rate at full beam intensity was tens of mHz.

### Trigger Hardware

Trigger hodoscopes, designated T1, T2, T3, and V, were employed to select neutrino interactions and reject backgrounds from the intense flux of muons generated in the PW7 dump. The scintillator hodoscopes are shown in Figure 1.

The main trigger required:

- hits in T1, T2, and T3 consistent with at least two charged tracks;
- track angles ( $\tan^{-1}$ ) with respect to the neutrino beam axis of  $< 250\text{mr}$ ;
- no hits in V (veto wall).

**Figure 1: The E872 scintillator hodoscopes.**

## Veto Wall

The most upstream component of the spectrometer is a veto wall consisting of 10 scintillation counters covering an area of  $140\text{ cm in } x \times 152\text{ cm in } y$ . The dimensions of each counter is  $30.5\text{ cm in } x$ ,  $152\text{ cm in } y$ , and  $10\text{ cm in } z$ . The counters are read out on each end by 5 inch EMI 9791 phototubes. This wall provides a charged particle veto signal for the neutrino interaction trigger. The veto wall is arranged in two layers to maintain a high efficiency.

## T1, T2, and T3 Hodoscopes

A plane of scintillating fibers is located downstream of each of the fiber modules 2 and 4. These planes are designated T1 and T2. Each plane is  $70\text{ cm} \times 70\text{ cm}$  in area and segmented into eight (T1) or nine (T2)  $10\text{ cm}$  bundles. Each bundle is read out by a Hamamatsu R5600 phototube.

A scintillator hodoscope, T3, is located downstream of the target/fiber system. T3 is composed of 8 counters, each  $10\text{ cm} \times 80\text{ cm}$ . The counters are  $5\text{ mm}$  thick and are attached to  $49\text{ cm}$  long light guides with phototubes (Philips 2262B 12 stage tubes) on each end.

## Electronics

### ***Event Timing***

## Trigger Logic

Figure 2 shows the trigger logic for the E872 experiment.

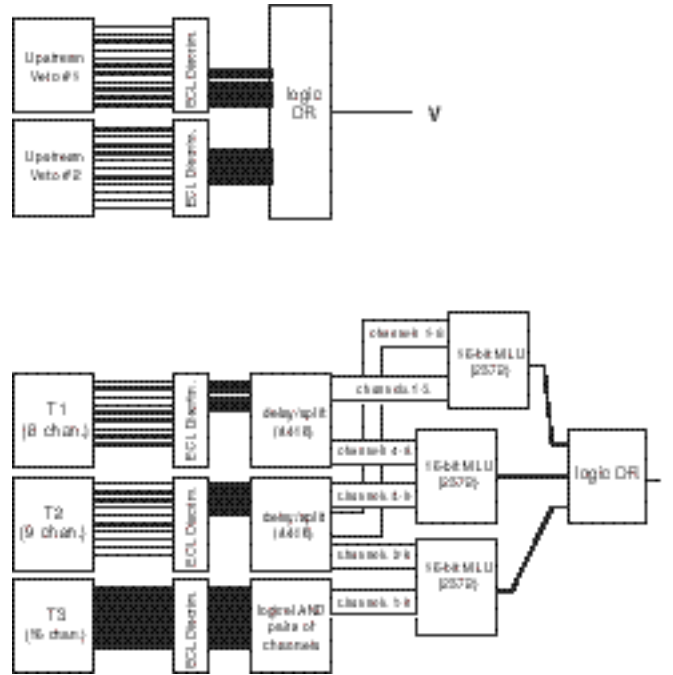


Figure 2 E872 trigger logic.

## Trigger Efficiencies

[We should say something here regarding the efficiency of the trigger elements and of the main trigger (at least) itself.]

	T1	T2	T3	V
No. of counters per plane	8	9	8	5
No. of planes	1	1	1	2
Counter Width(cm)	10	10	10	30.5
Counter Length(cm)	20(2), 40(2), 60(2), 80(2)	10(2), 30(2), 50(2), 70(2), 80(1)	80	152.4
Counter Thickness(cm)	~0.3	~0.3	.4	10.2
Total Area(cm <sup>2</sup> )			6400	20,917

Table 1: Scintillator Trigger Hodoscope Properties